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ABSTRACT

This training manual for emergency medical technicians, one of 14 modules that comprise the Emergency Victim Care textbook, covers water accidents, electrical emergencies, and hazardous materials and radiation accidents. Objectives stated for the three chapters are for the students to be able to describe: emergency care for specified water accidents, potential hazards associated with electrical emergencies, how to deal with vehicular accidents involving electrical lines, how to deal with an emergency involving downed electrical power lines, emergency care for victims of electrical shock, dangers involved with hazardous materials and/or radiation accidents, on-scene operations involved with these accidents, and emergency treatment procedures for victims. Informative material is provided on cold water near-drowning, immersion hypothermia, immediate care for cold water victims, river accidents and hazards, decompression sickness and air embolism, dangers in electrical emergencies, handling energized wires, types of hazardous materials, and radiation hazards. (YLB)

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EMERGENCY VICTIM CARE

Module 12

—Water Accidents
—Electrical Emergencies
—Hazardous Materials and Radiation Accidents

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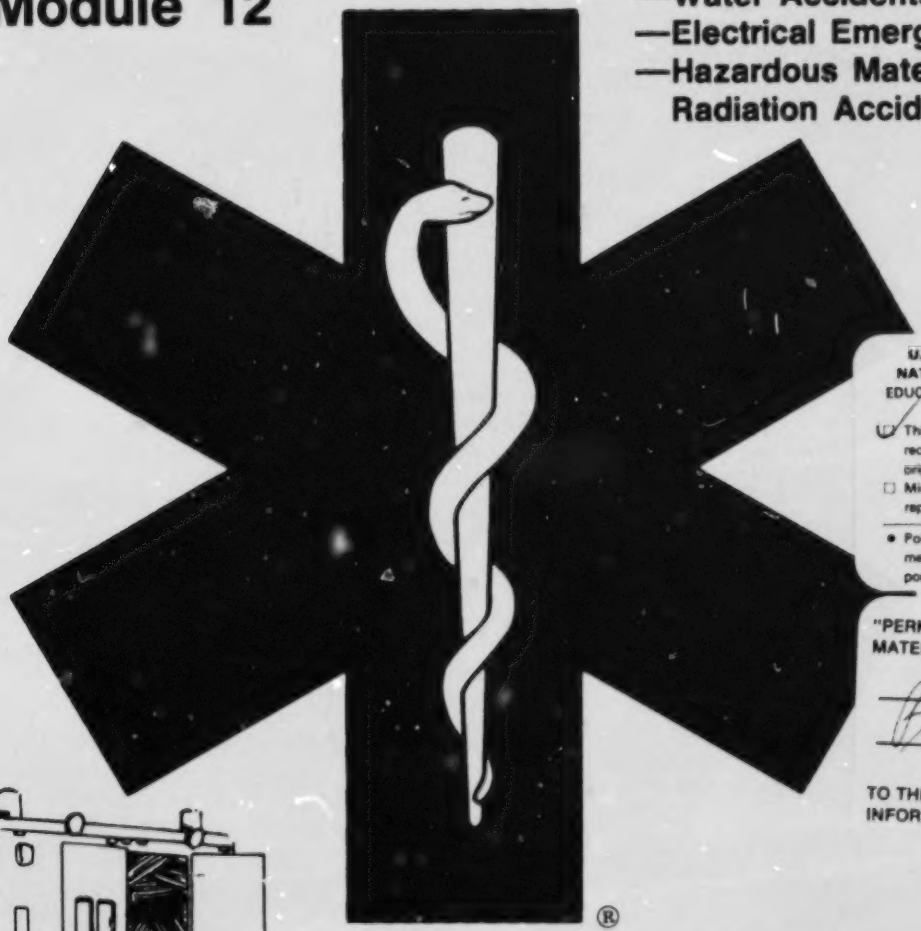

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This text is intended for use as a learning aid and to excite your curiosity and eagerness to serve patients. This text is not exhaustive and the opinions and directory comments will change from time to time as new procedures and laws become effective.

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EMERGENCY VICTIM CARE

A TRAINING MANUAL FOR EMERGENCY MEDICAL TECHNICIANS

OHIO TRADE AND INDUSTRIAL EDUCATION SERVICE

DIVISION OF VOCATIONAL EDUCATION
STATE DEPARTMENT OF EDUCATION
COLUMBUS, OHIO

TO THE LEARNER

The 1983 Emergency Victim Care textbook revision has been grouped into 14 modules. The modules have been grouped by content matter as follows:

Module 1

Preface
Foreword
Acknowledgment
Student-Instructor Relationship

Personnel
Emergency Medical Service Vehicles
EMS Communication
Records and Reports

Module 2

Equipment
Safe Driving Practices
Legal Aspects
Controlling the Situation
Action Evaluation Conference

Module 3

Anatomy & Physiology

Module 4

Vital Signs
Patient Assessment

Module 5

Cardiopulmonary Resuscitation (CPR)

Module 6

Bleeding Control
Wounds and Bandaging
Shock

Module 7

Medical Emergencies

Module 8

Crisis Intervention
Drug-Related Problems

Module 9

Backboards/Moving and Handling the Victim
Fractures
Dislocations

Module 10

Injuries of the Eye, Ear, Nose, Abdomen, C.N.S. and Genitalia
Burns and Environmental Injuries

Module 11

Childbirth
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Module 12

Water Accidents
Electrical Emergencies
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MODULE 12

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WATER ACCIDENTS

OBJECTIVES

Upon completion of the following chapter, you will be able to:
—describe emergency care procedures for specified water accidents such as:
—cold water near drowning victims
—immersion hypothermia victims
—cold water victims
—river accident victims
—diving accident victims

Following instruction and/or practice, you will be able to:
—demonstrate emergency care for specified water accidents.

INTRODUCTION

Drowning accidents account for approximately 8,000 deaths each year in the United States. Overall, it is the fourth most common cause of accidental death and ranks second only to motor vehicle fatalities among males one to 34 years of age and females 15-19 years of age. Over the past several years, many factors, especially the improved training in CPR, have improved the management of near drowning victims. Still, potentially revivable victims die due to misinformation or treatment by untrained rescuers.

COLD WATER NEAR DROWNING (DIVE REFLEX)

In areas of cold water conditions (70 degrees Fahrenheit or less), the old four to six minute rule of drowning must be forgotten. Time and time again victims of prolonged cold water submersions have been resuscitated without brain damage. Aggressive CPR, body core rewarming and sheer determination on the part of the rescuer have resulted in saving the lives of scores of victims submerged for periods of time up to one hour. The possibility of this phenomenon, known as the cold protective response or dive reflex, occurring to any victim submerged in cold water cannot be discounted in any drowning accident, especially those involving children. Aggressive life support must not be halted until the person is rewarmed to normal body temperature and still does not respond. However, do not attempt rewarming in the field. Seek additional medical attention immediately!

IMMERSION HYPOTHERMIA

Immersion hypothermia (lowering of the body's core temperature) should be considered in all cases of accidental involuntary immersion. When the water temperature is 50 degrees Fahrenheit (10 degrees Centigrade) or below, hypothermia may occur within a few minutes. When working with victims recovered from a cold environment, a quick sampling of body core temperature using a low reading rectal hypothermia thermometer should indicate what further actions need to be taken by the EMT. If core temperature is above 90 degrees Fahrenheit (32 degrees Centigrade), the victim will probably complain about the cold and will shiver quite violently. Movement may appear slightly uncoordinated. The victim should be able to answer questions reasonably well, but may appear somewhat lethargic or slow to respond; however, the victim should definitely be oriented to person, place and time. (orientation x 3) People rescued with core temperatures of 90 degrees Fahrenheit (32 degrees Centigrade) or above should survive the cold water immersion.

A deeper state of hypothermia exists when the core temperature is below 90 degrees Fahrenheit (32 degrees Centigrade). At this body temperature, the victim will have difficulty with physical movement and will appear uncoordinated. The muscles will feel stiff upon examination. Mentally, the victim may appear lethargic, withdrawn, confused, disoriented and unable to speak sensibly. Due to a lack of proper reasoning ability, the victim may insist on doing something totally inappropriate.

As in all cases of deep hypothermia, the body will continue to drop in temperature even after removed from the cold environment. As body temperatures drift to the low 80s or high 70s, the person may lapse into unconsciousness. Respiration and reflexes will be dramatically slowed, perhaps to the point of being unnoticed and with the stiffness of the muscles, the victim may appear dead. If not properly handled, statistics show that up to 65% of this group may die during the rewarming process.

IMMEDIATE CARE FOR THE COLD WATER VICTIM

For the purposes of the EMT arriving at the accident scene, cold water victims can be classified in two separate categories: showing life signs and showing no life systems.

COLD WATER NEAR DROWNING

This patient will appear dead with no apparent life signs and feel extremely cold. Begin resuscitation immediately, insulate the patient to maintain body heat while resuscitating and evacuate the person to a medical facility. Do not try to rewarm this person in the field. Field rewarming without blood gas balancing can cause heart failure due to acidosis. Evacuate the person to a medical facility where life support should be maintained while body temperature is raised and blood gases balanced. Do not expect the victim to respond to CPR while in the field. You will not be able to start a cold heart. Simply maintain life support and transport.

CONSCIOUS OR UNCONSCIOUS WITH LIFE SIGNS

Monitor the patient closely and resuscitate if necessary. Administer warm humidified oxygen. If this is not available, mouth-to-mouth resuscitation or proximity breathing, and timing your breath with the victim's will help to rewarm the patient from the inside out. Handle the victim gently. Do not allow a conscious victim to move unnecessarily or exercise. This can force the coldest blood in the extremities back into the core resulting in "after drop" or further core cooling. Instead, have the patient lie as still as possible.

Remove wet clothing from the person and replace with dry clothing or a blanket. Remember, continue to handle the victim gently. If, in your exhuberance to help, you carelessly move or bounce the victim, or turn the victim roughly to remove clothing, you could cause fatal injury. Handle the victim as gently as if the neck were broken. Continue monitoring and protect the victim against further heat loss. Evacuate to the nearest medical facility. Do not give any hot liquids by mouth and, of course, never give alcohol.

All persons involved in cold water near drowning should be seen at a medical facility or complications may arise within the next 24 hours.

THE RIVER ACCIDENT

Of all the rescues EMTs and rescuers are called upon to make, perhaps the most frustrating to the person not specially trained is the river accident. How discouraging it is to arrive at a scene and see a person in need of help in the middle of a rampaging, roaring river. Those at the scene, trained in river rescue, may realize the approach to the victim must be carefully considered with backup and safety for the rescuers assured. Techniques should already have been learned through a river rescue training session and practiced routinely. The trained EMT therefore, is frustrated by nontrained personnel who may be totally unaware of the hazards that lie in the force of the current and view the rescue as simply a direct approach to the victim in need of help. Too many times someone arriving at an accident scene will spot a person in trouble and die during the rescue attempt.

It must be realized the rescuers face the same type currents and force that put the victim in a state of peril. The rescuers must use extreme caution in any rescue attempt made! Too many times, quick unthought-out approaches have caused rescue personnel to die while attempting to rescue an original victim.

One should not think of river rescue as being impossible. Instead, high respect for the water must be possessed by all rescuers at the scene. This respect can be gained only through training and skill developed on moving water.

It is recommended that any EMS service which might be involved in a river rescue operation take a recognized course of instruction dealing with river rescue.

RIVER HAZARDS

CURRENT

No amount of flat water boating experience can substitute for skill development on moving water. The most apparent hazard any river rescuer must face is the sheer force of the river's current. A river running just six m.p.h. can exert well over 100 pounds of force against a body caught up in the current. Almost 700 pounds of force will be exerted in the same river against a small, swamped boat. Under these conditions, it is extremely difficult for a swimmer to fight the moving water. Standing in or wading a river with this force is almost impossible and should not be considered.

COLD WATER

As mentioned in the beginning of this chapter, cold water can kill. Obviously, it is a threat as much as to the rescuer as to the victim. Water absorbs the body's heat 25 times faster than the same temperature of air. A rescuer and victim can both be rendered helpless in a matter of minutes.

LOWHEAD DAMS

Hydraulics formed below lowhead dams are undoubtedly one of the major causes of death to river rescuers in Ohio. The current below these dams has been given the nickname "the drowning machine" because it forms such a predictable, inescapable deathtrap at certain water levels. As shown in Figure 1, the water falling over the dam creates a depression in the water on the downstream side where water must move upstream to fill in. An object flowing over the dam drops down into this depression and is carried under by the force of the water, released to the surface and sucked back to the face of the dam by the water moving upstream. From there the object is pushed down to the bottom again. This cycle can continue almost indefinitely. Large rescue boats with large, powerful motors have been rendered helpless and have capsized in this current along with many smaller canoes, kayaks and rafts. NO RESCUER, UNDER ANY CIRCUMSTANCES, SHOULD ENTER BODILY INTO THIS DANGER ZONE! Instead, lines can be thrown into the hydraulic and the victim pulled to safety across the boil line.

STRAINERS

A strainer is any type of "transparent" obstruction which allows water to flow through, but which strains out larger bodies. A downed tree, a cattle fence or a series of pipelines can all create hazardous conditions where the force of the current can throw a person against the obstruction and hold the person there, perhaps pinning the rescuer under water. A common rescue scene would be a person clinging to a log jam in the middle of the current in need of rescue. THE AREA UPSTREAM OF ANY STRAINER MUST BE AVOIDED. A safer approach would be from the downstream side of the hazard.

THE DROWNING MACHINE

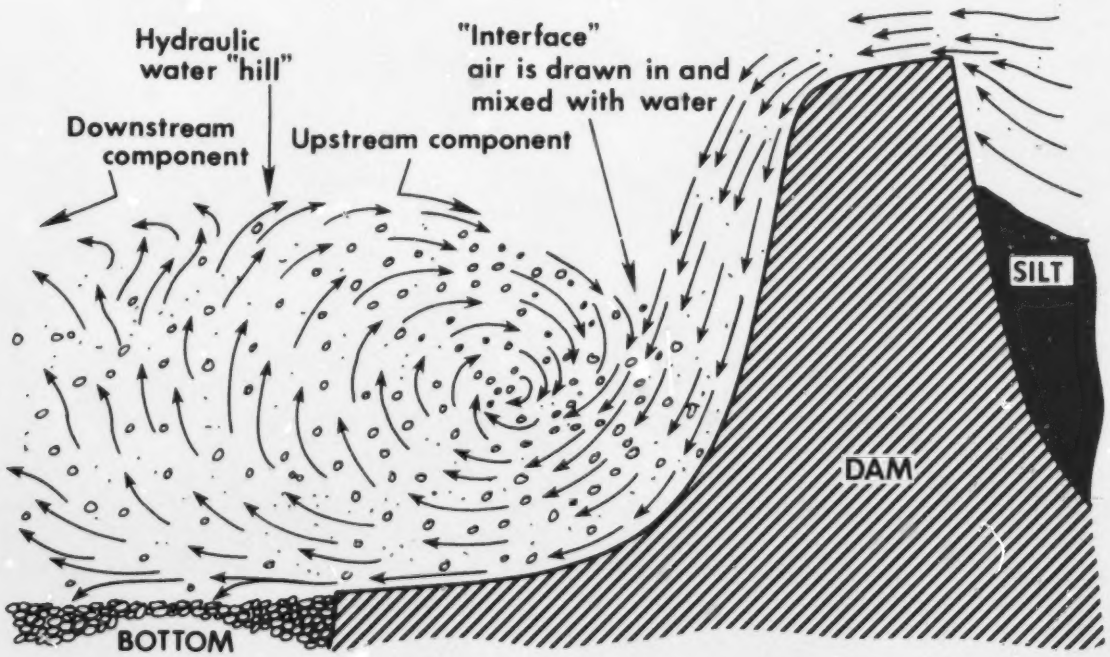

Figure 1. The Drowning Machine

PERFORMING THE RIVER RESCUE

All aspects of river rescue techniques cannot be covered here; however, a few important points must be kept in mind. When answering a rescue call involving moving water, especially at a dam site, the rescuer should:

1. employ throw lines from shore to retrieve the victims. Never enter the water or launch a boat on the water when the victim can simply be retrieved from shore.

2. not attempt to affect a rescue in full fire-fighting turnout gear. Instead, warm clothing or wet suits should be worn. IT SHOULD GO WITHOUT SAYING THAT ALL RESCUERS MUST WEAR A COAST GUARD APPROVED LIFESAVING DEVICE. The lifesaving device must be in good condition and worn correctly and securely.

3. before launching a boat, consider whether it is designed to perform tasks on fast-moving water. Do not overload the boat! Remember, the victim may become part of your load. Have prior training in boat operation in moving water!!!

BEFORE THE RESCUE CALL

Before being called to an accident scene, any rescuer or EMT with moving water responsibilities should become acquainted with experts on fast-moving water techniques within the community. These persons may be associated with canoe and kayak clubs or other boating organizations.

A survey must be made of local water areas. Become familiar with the locations of lowhead dams and other hazards, and establish a means of access to these sites. The best rescue is prevention of the accident. Take the time to get these sites marked as hazardous areas.

DIVING ACCIDENTS (WHILE SWIMMING)

It is unfortunate that victims of diving accidents are usually taken from the water before the emergency medical service arrives. Because of improper handling, many victims with neck injuries have died or been paralyzed for life.

A fracture to the neck should be suspected in all diving accidents. Victims of diving accidents should always be moved in such a way as to avoid moving the neck. A diving accident victim should be removed from the water only after the neck injury or suspected neck injury is immobilized.

If the victim is floating face up in the water with the water supporting the victim's weight, very little effort is needed to maintain the body in a straight line. A backboard should be floated under the victim.

If the victim is face down in the water, the EMT should grasp the victim under the armpits and pull the body in the water by walking backward in shallow water or by utilizing a breaststroke kick in deep water. Once momentum is obtained and the victim's legs are in a horizontal position with the rest of the victim's body, the rescuer maintains momentum and turns the victim to a face-up position while following the steps depicted in Figures 2, 3 and 4. Once the victim is leveled off and in a face-up position, a backboard is gently "knifed" under the body. The victim SHOULD NOT BE MOVED UNTIL ALL PARTS OF THE BODY HAVE BEEN COMPLETELY IMMOBILIZED. This includes the feet which are to be secured to the backboard and special footplate.

If artificial respiration is required, the routine head tilt maneuver should not be used. Artificial ventilation should be accomplished with the head maintained in a neutral position and using a modified jaw thrust maneuver to open the airway.

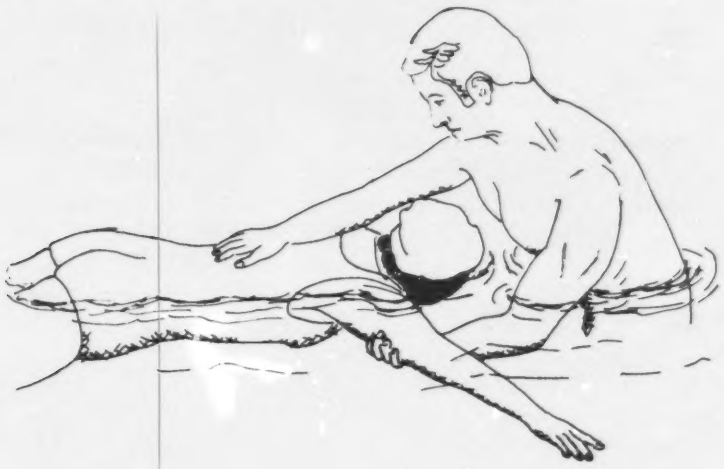

Figure 2. Starting to turn victim over. Right arm is against side of victim's head to provide support and maintain straight line of head, neck and body.

Figure 3. Victim half-turned. Note position of both arms, supporting head in straight position.

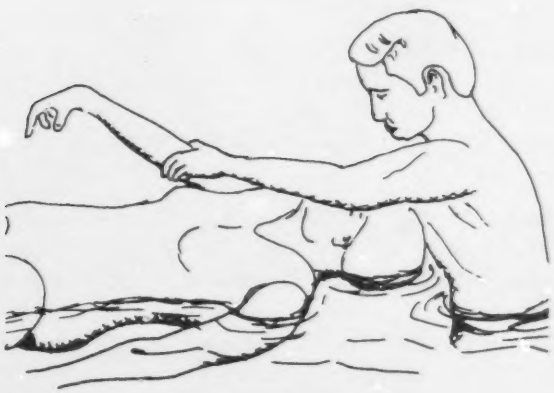

Figure 4. Completing turnover of victim.

DECOMPRESSION SICKNESS AND AIR EMBOLISM

The availability of excellent quality, self-contained underwater breathing apparatus (scuba) has made diving one of the country's most popular individual sports. Scuba divers can be found in nearly every city of the United States. The EMT must be aware of the hazards a diver can encounter, the symptoms and the emergency care. The EMT should also be aware that most of these same hazards are faced by the tunnel worker who returns to normal pressure too rapidly or when the nonpressurized aircraft is exposed to high altitudes, or the loss of cabin pressurization in a pressurized aircraft at high altitude. The number of people exposed to these hazards increases every day.

Decompression Sickness is the result of a too rapid return to normal pressure. Nitrogen is absorbed in the blood and tissues while under increased pressure; there it remains with no damaging effects. However, when the pressure is reduced too rapidly, the nitrogen does not have the time needed to dissipate harmlessly. Instead, the nitrogen returns to its gaseous form and produces bubbles in the blood or tissues. Decompression sickness can occur at any time up to 24 hours after returning to normal pressure. However, 85% of the time it will occur within the first hour.

Air Embolism is the result of air in the pulmonary circulation which was introduced through ruptured lung tissue caused by overpressure in the lungs during too rapid ascent or breath-holding ascent. An air embolism is the obstruction of normal blood circulation by an air bubble lodged in a blood vessel. Air embolism is an extreme emergency. It will normally occur very suddenly after surfacing and it is very dramatic.

SIGNS AND SYMPTOMS

Bends is a type of decompression sickness or a symptom of decompression sickness. Symptoms are a mild to severe, deep boring pain, usually located in or around joints, most commonly the knees, ankles, shoulders, or elbows. While bends itself is not life-threatening, it indicates that bubbles have formed. Bends is by far the most common type of decompression sickness and, if left untreated, can progress to more serious problems.

Chokes is another type or symptom of decompression sickness, and is much more serious. It is characterized by a burning substernal pain, dyspnea and a cough.

Other symptoms are:

1. Weakness
2. Dizziness
3. Speech, hearing and/or vision impairment.
4. Headache
5. Convulsions
6. Unconsciousness
7. Respiratory arrest
8. Cardiac arrest

Symptoms of decompression sickness or air embolism, no matter how slight, must not be ignored. Permanent injury or death could occur.

EMERGENCY CARE

The EMT must be aware that air tanks used for underwater sports contain pressure of 2,300 to 3,000 p.s.i. and should take the same precaution as when handling oxygen tanks. Most straps and buckles are of the quick disconnect type and are easily removed. The EMT should also be aware that a rubberized suit may be very difficult to remove from a diver and to prevent further injuries to fractures, etc., it may be best to cut the suit from the diver.

Start artificial respiration immediately if indicated. Treat for shock. Place victim on a 15° incline with head down and slightly on the left side. Administer 100% oxygen. Maintain body temperature. Transport to a medical facility, then to a recompression facility.

Emergency procedures when air embolism or decompression sickness is suspected:

1. Check for identification that shows victim is a diver.
2. Make every attempt to learn the history of the dive and the events leading to the accident. This information must be passed on to the recompression facility as accurately as possible.
3. Establish communications if possible with the physician in charge at the chamber facility which will treat the victim. Explain the signs and symptoms, give history of dive, answer all questions, follow all instructions.
4. Follow instructions for transporting the victim to the recompression facility. If air transportation is indicated, it must be a low level altitude flight or in an aircraft with a pressurization system capable of maintaining sea level equivalent pressure.

Recompression chambers for the Ohio area:

RECOMPRESSION FACILITIES FOR THE STATE OF OHIO:

Department of Oncology
Christ Hospital
2139 Auburn Avenue
Cincinnati, Ohio 45219
(513) 369-2000

U.S. Air Force Medical Center
Wright-Patterson Air Force Base
Dayton, Ohio 45433
(513) 257-2968
(513) 257-2969
(513) 878-6623

University of Michigan
Medical Center
Diving Medical Specialist
(313) 764-4244
Request Motorola Page #146

ELECTRICAL EMERGENCIES

OBJECTIVES

Upon completion of the following chapter, you will be able to:

—recognize the importance of safety precautions to be observed in dealing with electrical emergencies.
—describe the potential hazards associated with electrical emergencies.
—describe how to deal with vehicle accidents involving electrical lines.
—describe how to select the best method of extricating a victim from a vehicle.
—describe procedures to deal with an emergency involving downed electrical power lines.
—describe emergency care procedures for a victim of electrical shock.

Following instruction and/or practice, you will be able to:

—demonstrate proper use of tools in the extrication of victims from motor vehicles involved in electrical emergencies.
—administer proper emergency care to a victim suffering from electrical shock.

INTRODUCTION

EMTs are not presumed to be electricians nor electrical lineworkers but their duties may require them to face situations involving electrical equipment or wiring. Therefore, they should be able to recognize electrical hazards and know the proper action to take when encountered.

Saving property alone never justifies the risk of a person's life. When life is involved, the urgency is greater; necessity prompts the EMT to act in the face of great danger. The EMT, however, should think before taking action. Moreover, unless EMTs know what they are doing, they should seek help from qualified personnel.

Electrical power has become so common that facilities for supplying electricity are present in almost every part of every community. Emergency medical personnel can prepare themselves to deal with electrical hazards by learning methods for handling electrical equipment and wiring.

THE INFORMATION IN THIS CHAPTER IS MERELY SUGGESTIVE. It is the responsibility of the department head or the emergency medical service officer to reach an agreement with the appropriate officials of the local power company as to procedures to be followed in an emergency involving the company's property and equipment, or any other property where electrical equipment or wiring is concerned. All EMTs and all power company employees who are subject to call when an emergency occurs should be thoroughly familiar with whatever procedure has been mutually approved. In many cities a power company unit responds to each emergency where electrical hazards may be encountered. Regardless of this policy, someone must call the power company immediately when any emergency involves electrical hazards within the company's area. The EMT requesting assistance from the power company must clearly inform the receiver of the call as to the electrical equipment involved (transformer, overhead wires, underground cables, etc.) and its location. This will facilitate service and make for maximum cooperation.

RECOGNIZING DANGER

ELECTRICAL DEFINITIONS

Voltage, or potential difference, is the force which causes or attempts to cause current to flow. Voltage is measured in units called volts, abbreviated V. It corresponds to the pressure in a water system. Several commonly encountered voltages include: flashlight battery—1.5 V; line voltage in home receptacles—120 V; high-tension power transmission lines—69.000 to 765,000 V; ECG electrode signal—1 millivolt (mV)=0.001 V.

Current is the flow of charged particles. The flow of current is what enables electricity to do work. The unit of current is the ampere, often called amp, with the symbol A. Current is the most significant electrical parameter in determining physiological effects. Typical currents are: 1000 watt iron—8.3 A; ⅜ inch electrical drill—3.6 A; 7¼ watt Christmas tree bulb—63 milliamperes (mA)=63/1000A.

Resistance is the characteristic of materials to oppose the flow of current. Resistance is measured in ohms. The symbol for the ohm is the Greek letter omega Ω. The analogs to resistance in a water system would be obstructions or restrictions in the path of the water or friction loss. Some examples include: 1000 watt iron—14 ohms; 7¼ watt Christmas tree bulb—2000 ohms; electronic circuits—less than 1 ohm to greater than 100 million ohms.

Circuit is a complete or closed path around which current can flow. A circuit comprises conductors (wires) and materials or devices having resistance connected to a source of voltage. Circuits may have many branches or parallel paths for current flow. The conditions for current to flow are a source of voltage and a closed circuit connected to the source.

Voltage, current, and resistance are related by a very simple expression known as Ohm's Law. Ohm's Law states that the current is equal to the voltage divided by the resistance. Mathematically, if E = voltage, I = current, and R = resistance, then I = E/R. Because most electrical systems have fixed voltage levels, and because resistance is characteristic of the size, shape and material of an object, the current drawn by the object can be calculated from Ohm's Law. For example, the Christmas tree lamp has 2000 ohms resistance. By Ohm's Law the current is 120 V/200 = .060 A = 60 mA, which is close to the 63 mA listed above.

Alternating Current (AC) occurs when the voltage periodically changes from positive to negative and the current flow reverses accordingly. **Direct Current** (DC) means the voltage polarity and current direction remain constant. Residential wiring, most industrial power, and most high voltage transmission lines are AC systems. Battery powered devices use DC. The shock hazard of DC is slightly less than at the 60 Hz (hertz or cycles per second) frequency used in the United States for power distribution.

PHYSIOLOGICAL RESPONSE TO CURRENT

Tissues respond to electricity in several ways. Static electricity is seen at science fairs and on science fiction movies, where it makes hair stand on end. By itself static electricity is not likely to be harmful. It can startle, possibly causing a fall or other injury. Stimulation of nerves can cause pain or excitation of the muscles controlled by those nerves. Direct stimulation of muscle contraction by electrical current and burns due to power dissipated in tissue by electricity are probably most significant to the EMT.

The physiologically significant electrical parameter is the current. The current is determined by the applied voltage and the resistance of the tissues involved (Ohm's Law). Current tends to follow the path of least resistance. Tissues like blood and muscles usually carry higher currents than fat or bone. While nerves have fairly low resistance, their cross-sectional areas are relatively small. Thus, in electrical shock incidents nerves carry small currents compared to other tissues.

Because many other factors affect both the current and the body's response to current, it is necessary to discuss the effects in terms of probabilities, statistics, or ranges of values. In general, the severity of the shock increases with the time the current flows and with the area of the contact. Victims with larger body weight usually have higher thresholds of current for a particular response. A more muscular person has lower resistance (hence, higher current) than the very slim person or the very obese person. Experiments have indicated that threshold currents for women are about two-thirds of those for men.

As the current increases the sensation gets stronger, then becomes painful and begins to cause muscle contractions. Muscle contraction can be directly stimulated by electric current regardless of any signals received from motor nerves. When the current reaches 10-15 mA, the muscles of the arm are paralyzed. The victim cannot let go of anything grasped in the hand. This is because simultaneous stimulation of flexor and extensor muscles of the fingers keeps the fingers curled. Although unable to let go, the victim may fall or be thrown free by reaction of muscles of the upper arm, leg, or back.

Paralysis of chest muscles occurs at 30 mA.

Table 1. Physiological Effects of Electric Shock

9-1 mA	None
1-10 mA	Sensation, pain
10-30 mA	Paralysis of arm, can't let go
30-75 mA	Respiratory arrest, fatal if sustained
75 mA-4A	Ventricular fibrillation, cardiac arrest; frequently fatal
4A and up	Heart paralysis, may restart if duration is short; mortality depends on tissue damage

The following section describes the response to increasing levels of current. The values of current specified are generally median values for an average man (68 kg) in good health. A subsequent section describes situations which may produce some of the more dangerous current levels. These currents are at 60 Hz, the power line frequently used in the United States. The typical current path is across the chest, from limb to limb, usually hand to foot.

Very small currents have no apparent effect. They cannot be felt and cause no harm. Holding a flashlight battery by the ends probably causes a few millionths of an ampere to flow through the fingers, but there usually is no sensation of electric shock. The mean threshold of perception is 1 mA. This is the amount of current that approximately 50% of men can just feel as a sensation of tingling or warmth.

As long as at least this much current flows through the chest, the victim is unable to breathe. Prompt rescue is critical to the chances for survival of any victim of currents greater than the respiratory paralysis threshold. The muscle contractions and pain from currents in the "can't let go" range cause sweating. Sweating lowers the skin resistance and increases the current, possibly into the lethal range. If the current is interrupted before hypoxia has done too much damage, breathing may restart.

The most severe problems occur at currents from 75 mA to approximately 4A. This amount of current causes ventricular fibrillation. When the heart is in ventricular fibrillation, it does not effectively circulate blood. Interruption of electrical current will not restore circulation. Most fatalities from electric shock are the result of ventricular fibrillation. As soon as this victim

is extricated from the electric circuit, CPR and other resuscitative techniques appropriate to cardiac arrest should be initiated immediately.

Currents greater than four amperes are, statistically, less dangerous than smaller currents. Current of this magnitude paralyzes the heart. If the duration of the shock is short, the heart may restart after the current stops. It is the same principle that is used in defibrillators. Accidental shocks are random in duration, amplitude, and wave shape, which make their defibrillating potential unpredictable.

Currents large enough to cause heart paralysis also cause burns. Electrical burns are third degree with damage to underlying tissues. Small, open wounds appear at the contact points where arching burns the skin away. Remember, current requires a closed circuit—if it goes in, it must come out somewhere. A thorough check for the exit wound(s) is important because it helps in estimating which organs and structures may be affected. The entry and exit wounds are minor compared to the internal tissue damage caused by sustained high current. The current cooks the tissues it passes through by heating them, just as a light bulb is heated by the passage of current. Tissues with low resistance, such as muscle, are affected most.

Deep burns from electrical shock may not be apparent to the EMT immediately after the incident. However, the tissue damage can be fatal, so it is important to recognize the possibility of this injury. The victim should be hospitalized for observation and assessment of damage. Severe burns usually occur in high voltage circuits (440 V and up). Any electrical shock incident involving an industrial plant or power transmission lines should be considered likely to cause burns. Burns should also be suspected in any incident where the shock duration was more than a minute or two, regardless of the voltage or current.

Table 1 is a summary of the effects of various amounts of current. While the details are not important in an emergency situation (there will rarely be any way to measure the current and duration of the shock), a familarity with the types of effects may make evaluation of injuries easier and more accurate.

EXAMPLES

To help EMTs relate to such terms as 75 mA, several typical electrical shock examples with probable associated current levels are given below.

1) A pipe breaks. After shutting the water off, the homeowner decides to drill a hole through a floor joist to repair the plumbing. The homeowner's old drill has the grounding pin broken from the plug. With the water on the floor, the homeowner is well grounded. The resistance of a dry hand around a drill handle is 100-300 ohms. Wet hands might have half as much resistance. If the drill short circuits to the case, 120 volts would appear across the resistance of the homeowner's hand and body. From Ohm's Law, the current is 120/3000=40 mA. With wet hands, the current could go up to 240 mA. This homeowner will probably experience respiratory arrest and perhaps ventricular fibrillation.

2) A lineworker working for the electric company is repairing a storm-damaged transformer. The line voltage is 13,000 V between wires, or about 7,600 V from one wire to ground. Because this line serves many other customers, the damaged transformer has been disconnected, but the line is energized. The lineworker is working in an insulated, elevated bucket.

One of the energized wires suddenly breaks and falls across the lineworker's back while the worker is working on the transformer. The transformer case is grounded. A lineworker on the ground sees and hears the arc jumping from the wire to the victim's back. Immediately this worker swings the bucket away from the pole, breaking the circuit. High voltage arcs puncture the skin, leaving only the 200-100 ohm internal resistance of the body to limit current. Using Ohm's Law gives the current =7600/1000=7.6 A to 7600/200=38 A.

When the bucket reaches the ground the victim complains of pain in the back and hands, which are burned. The victim cannot see because of flash burns to the eyes. Muscles and organs in the back, chest and arms may have been burned by high currents. Since the current only lasted a few seconds, the victim probably will recover if infection does not set in.

3) Microshock is used to describe effects of very small currents applied directly to the heart via catheters or pacemakers. Connecting several electrical devices to a patient with a conductor on the heart can be very hazardous. As little as 30 uA (30 millionths of an ampere) applied to sensitive areas of the heart can cause failure to pump blood.

ECG electrodes make low resistance connections to the body. Skin resistance is largely overcome. Patients wired for diagnostics or treatment are susceptible to injury at much lower voltages than someone whose skin resistance is intact. Any electrical or electronic device which might come in contact with a monitored patient should be tested regularly for leakage.

ACTING IN AN EMERGENCY

The only completely safe thing to do with fallen wires is to stay clear of them and call the power company. In some cases, however, waiting for the power company crew may mean the difference between life and death. Therefore, it is essential for emergency medical personnel to have a reasonable working knowledge of the electrical hazards and emergency situations that may confront them in each community they service.

If wires are down, upon arrival at an emergency proceed as follows.

Radio for the power company and move the crowd back from the **danger zone** (at least one span each way from the break or the sagging wire.) See Figure 1. This is necessary for several reasons.

1. The spans of wire adjacent to the trouble may have been weakened.

2. Any movement of the wires in trouble, caused by the wind or rescue work, may burn other wires down.

3. Wires on the ground may burn through at some point and the ends may curl up, roll along the ground, and cause injury to someone.

4. Burns, electric shocks, or eye injuries from electrical flashes may occur even though a per-

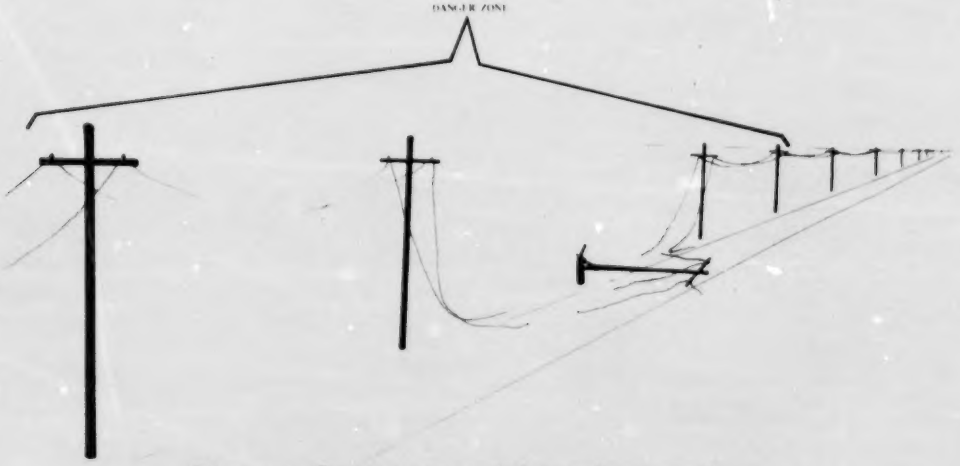

Figure 1. Danger zone of downed power lines

son is not in direct contact with the wires. Therefore, do not permit anyone to stand near weak or broken wires.

EMERGENCIES INVOLVING VEHICLES

In emergencies involving a motor vehicle, the rubber tires may insulate the vehicle from the ground, so that although the vehicle itself may be charged, there will be no current flowing from the vehicle to the ground. In such a case, passengers will be relatively safe if they remain inside the vehicle. A person touching the vehicle while standing on the ground, creates a path of current flow through the body which can often prove fatal.

An example is that of a woman whose car became energized from a fallen wire as the result of hitting a light pole. In her fright, she jumped out of her car. After moving away from the car, she realized she had left her purse on the seat of the car. She returned to the car and, upon touching the door, was instantly electrocuted.

CHARGED EMERGENCY APPARATUS

A person will be relatively safe providing contact with the apparatus and the ground is not made at the same time. If the equipment is believed to be in contact with a live wire, and you must get off, DON'T STEP OFF—JUMP OFF. Your hands, feet, and body must clear the vehicle completely before you touch the ground. From the moment that you contact the ground, you must **not** touch the vehicle.

HANDLING ENERGIZED WIRES

If a dry rope is thrown from a reasonable distance over wires carrying high voltage, the person throwing it will not be harmed. If the rope is wet when placed in contact with energized wires, the EMT can receive a shock which may prove fatal.

Polypropylene rope is completely nonconductive. It will not absorb moisture. This type of rope is ideal for use with electrical hazards. Polypropylene rope must be kept clean at all times and carried in a canvas bag, marked "For Electrical Use Only."

If action is necessary to remove a wire from a victim, a rope-and-weight tool can provide a means to handle wires safely in any weather. However, the EMT must be thoroughly trained in its use. EMTs who can throw the weights efficiently will be able to pick up a live wire with relative safety, regardless of the position in which it falls.

This rope tool consists of two weights, each weighing approximately one-half pound, attached one to each end of a 100-foot, one-quarter-inch rope. See Figure 2. The rope must be free of any metallic substance to be safe in use. Any emergency unit can make this device for little cost. It is recommended that one be in service on each unit in operation.

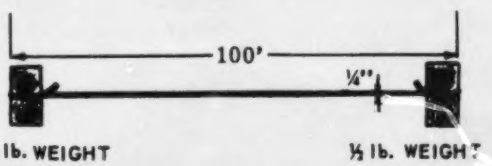

Figure 2. Tool made with rope and two weights for handling live wires.

USING THE ROPE

Emergency medical personnel should be trained in the use of the weighted rope. Only practice can make them proficient in handling live wires safely in this manner.

With this tool an EMT can gain control of a fallen wire without getting near the wire. After the rope is in contact with the wire, approved and adequate insulating equipment will allow the EMT to move the wire by pulling on the rope. A pair of approved lineworker's rubber gloves and glove protectors, and a lineworker's "hot stick", tested for use on high voltage, are

Fig 3. Hot stick

required. See Figure 3. With this equipment the wire may be moved as follows.

1. Clear all persons out of the danger area, as described earlier.

2. Put on lineworker's rubber gloves **and glove protectors.**

3. Stand opposite the point to which you want to move the wire and approximately 30 feet from the wire.

4. Toss one end of the weighted rope under the wire to a point about equal to your distance from the wire, on the other side. See Figure 4.

5. Toss the other end over the wire so that it lands near the first weight thrown.

6. Pick up the two weighted ends with the hot stick, and drag the wire out of the way. (Be sure the wire is guarded.)

7. Keep in mind at all times that the ground may be energized for some distance around the fallen conductor.

It must be remembered that any fallen wire is dangerous and can mean instant death to poorly trained emergency medical personnel. When a human life is involved, however, EMTs will have to take immediate rescue action. In such situations the action taken will be founded on past experiences and training. Here every second counts, yet caution must be exercised so that the seriousness of the original emergency is not increased because of the overzealous action taken by an EMT or other person nearby.

HOT STICKS

Hot sticks are specially designed tools used principally by electric company linepersons to manipulate energized conductors into a desired position. They are specially treated by the manufacturer to prevent moisture from penetrating the wood. They should be kept in a compartment or other container on the rescue truck to prevent damage while in storage. They should be inspected at regular intervals by someone who knows their construction even if they have not been used since the last inspection. See Figure 3.

REMOVING VICTIM FROM WIRE

When a person is found lying on an energized wire, and the wire is not entangled around the victim, a quick method of rescue is to employ a hot stick to push or pull the victim from the wire. While being removed from an energized line, the victim may receive additional burns, but this is not as serious as having the victim remain in contact with the energized conductor.

The rescue worker should stay as far away from the victim or the wire as the hot stick will

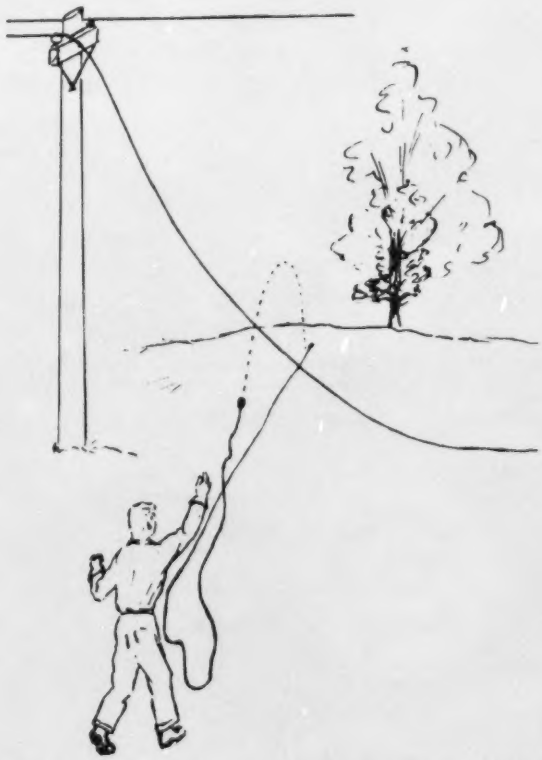

Figure 4. Person throwing rope with weights

permit. If additional help and another hot stick are available, they may be employed in the rescue operation. One person may hold the live wire immobile while the other person moves the victim from contact with the wire. This additional assistance can prevent the end of a live wire from whipping in a manner similar to that of an unattended garden hose that is discharging water from an open nozzle. Also, by keeping the wire in contact with the ground, the exposure of a victim to additional shock and burns is kept to a minimum.

In cases where hot sticks are not available, an alternate procedure may be applied.

Use a long, dry rope (of a type referred to in Figure 1) to loop around some part of the victim's body in a manner that will permit dragging the victim from the danger area. This alternate procedure may require the EMT to perform the rescue operation from a position much closer to the victim and/or the wire than the maximum distance allowable when hot sticks are employed. This must be done while taking all necessary precautions to prevent the worker's body or clothing from making contact with the victim's body or clothing, or the wire itself. These precautions are necessary until the victim has been removed from the danger area. Bystanders should be ordered to remain at least a minimum of 100 feet away from the victim. This will prevent them from coming into contact with anything which may be energized, thus eliminating the chance of additional victims.

EMERGENCY CARE AFTER RESCUE

Electrical shock may induce a variety of phenomena ranging from the benign to the lethal. The outcome depends largely upon the amplitude and duration of contact with the current. Other than burns of varying severity and injuries due to falls, the possible emergency events to be recognized include:

1. Tetany of the musculature of breathing. This is usually confined to the duration of the shock but may produce secondary cardiac arrest if the tentanizing shock is of a prolonged duration.

2. Prolonged paralysis of respiration. This may result from a massive convulsive phenomenon and may last for minutes after the shock current has terminated.

3. Ventricular fibrillation or other serious cardiac arrhythmias (such as runs of premature ventricular contractions or ventricular tachycardia that may progress to ventricular fibrillation). This is produced by low voltage currents (110v to 220v) sustained for several seconds.

The prognosis for victims of electrical shocks is not easily predictable since the amplitude and duration of the charge usually are not known. Failure to either respiration or circulation is likely to result.

After safely clearing a victim from an electrically energized object, the rescuer should determine the victim's cardiopulmonary status immediately. If spontaneous respiration or circulation is absent, the technique of cardiopulmonary resuscitation outlined in this chapter should be initiated.

In cases where electrical shock occurs on a public utility pole, a precordial thump should be delivered and mouth-to-mouth ventilation started at once. The victim must **then** be lowered to the ground as quickly as possible. CPR is only effective when performed on a victim in the horizontal position.

HAZARDOUS MATERIALS AND RADIATION ACCIDENTS

OBJECTIVES

Upon completion of the following chapter, you will be able to:
—recognize the importance of safety precautions.
—describe the dangers involved with both hazardous materials and/or radiation accidents.
—describe the proper on-scene operations involved with hazardous materials and/or radiation accidents.
—describe emergency treatment procedures for victims of hazardous materials and/or radiation emergencies.

Following instruction and/or practice, you will be able to:
—demonstrate proper procedures in handling hazardous materials and/or radiation.
—administer emergency care to a victim of an accident involving hazardous materials and/or radiation.

INTRODUCTION

In today's world of ever-changing technology, the general public is being exposed to a wider variety of hazardous materials. These materials are found in warehouses, factories, industrial facilities, truck terminals, highway and rail transports, etc. It is important, therefore, that the EMT responding to a hazardous materials emergency be aware of potential risks for the EMT as well as for the victim.

No substance is harmless. There are only harmless uses. These substances have been categorized into three major hazard groups.

1) Health hazards

2) Flammability or combustibility

3) Instability or reactivity

I. HEALTH (TOXIC) HAZARDS

Routes of Toxicity

A. INGESTION (ORAL)

Obviously, one thinks of ingestion as eating, drinking or smoking something toxic or contaminated by some toxin. However, many of the fumes are water-soluble and *can* go into solution with an individual's saliva, thus providing access for toxicants to the digestive system.

B. ABSORPTION

Once again, one thinks of the obvious; material, usually in the form of liquid or aerosol, coming into contact with the skin. However, many of these water-soluble gases are absorbed by water or perspiration and are absorbed via the pores. Also, the eyes are particularly vulnerable.

C. INHALATION

Inhalation toxicants are of several types:
1) Irritants—Ammonia, Chlorine, Acids
2) Asphyxiants—0_2 displacement CO_2, Nitrogen Chemical Asphyxiant CO, Cyanide
3) Anesthetic/narcotic—Hydrocarbons (Propane, ethers) Chlorinated Solvents (Chloroform)
4) Systemic poisons—Metal oxides (M_nO_2), Metals

5) Carcinogens—Benzene, Ketones, Vinyl Chloride
6) Lung Scarring materials—Asbestos, Silica

D. **INJECTION**
Anything which compromises the tissues (cuts, abrasions, etc.) and exposes blood, plasma or lymph to the open air can be a route for toxicity, just as though a needle were used.

II. **FLAMMABILITY OR COMBUSTIBILITY**
The ease of which a substance will ignite and burn determines whether it is considered nonburnable, combustable or flammable. This is a function of several physical properties of a substance.

A. **CHEMICAL FORMULA**
Can the substance be reduced by oxidation?

B **FLASH POINT**
The temperature at which a liquid will form sufficient vapors to form an ignitable mixture.

C. **IGNITION TEMPERATURE**
The temperature at which a substance, whether solid, liquid or gas, will ignite and continue to burn **independent of any flame contact or other heating source.** (If it gets hot enough, it will burn.)

D. **FLAMMABLE (EXPLOSIVE) RANGE**
This is vapor/air mixture expressed as a percentage. Too lean a mixture will not support combustion as will too rich a mixture. Concentration in the middle of the flammable (or explosive) range will yield the most active combustion.

E. **SPECIFIC GRAVITY**
This is the weight of a substance in ratio to the weight of water (water = 1.0). This indicates whether a substance will float upon, mix with or sink in water.

F. **VAPOR DENSITY**
How heavy is the vapor? Is it lighter than air, and quickly dispersed? Is it heavier and does it travel a considerable distance to a source of ignition?

G. **VAPOR PRESSURE**
This indicates how quickly a liquid will evaporate, possibly forming an explosive mixture. This is known as a volatile liquid and is not necessarily flammable.

Remember, the most flammable liquids are those with a *low* flash point and a *high* vapor pressure.

III. **REACTIVITY AND INSTABILITY**
When a material is reactive it will change chemically when in contact with another substance. In our context, when this change liberates heat it is considered "reactive".

Unstable means a material is fully capable of self-destruction or instantaneous decomposition. It may also be **extremely** sensitive to shock, heat or friction.

Unstable materials may **detonate.** Detonation is an explosion characterized by a high velocity shock wave followed by a flame front. These materials may **deflagrate.** Deflagration is an explosion which produces a flame front first, then follows a slower moving shock wave. A deflagration may be described as a **very** rapid burning.

IDENTIFICATION AND RECOGNITION

This system of labeling and placarding is keyed to the U.S. Department of Transportation *Emergency Response Guidebook.*

Figure 1

A four-digit number is printed upon a color coded placard. This four-digit number identifies

the specific material or chemical group. The important thing to remember though is the *COLOR CODE. (See Figure 1.)*

PLACARD & LABEL

Color Code	*Material Description*
Orange	High explosive. These will detonate. Examples: TNT; Dynamite
Orange Explosive B	Low explosives; Low explosives do **not** mean low hazard. These are products that will deflagrate. Propellant explosives. Example: Gunpowder
Orange Explosive C (label only)	Pyrolectmics. Small individual container of explosive material. Examples: Fireworks, small arms ammunition
Orange Blasting agents	Binary explosives. Comes in two parts which must be premixed in order to function as an explosive
Green Non-Flammable gas	Gases which generally will not burn, but are contained in pressurized containers. Example: Nitrogen. Exception: Anhydrous ammonia. Although classed as non-flammable it will burn. (Lel 16% Vel 25%)
White Poison A	This an extreme toxic hazard. This placard, instead of saying Poison A, states **POISON GAS.** However, a Poison A may be in any form; liquid, gas or solid. Examples: Hydrogen Cyanide, Nitrogen Dioxide
White Poison B	According to U.S. Department Of Transportation, Poison B (Placard **Poison**) is a moderate poison. Examples: Tetraethyl lead; epechlorohydrin
Red Flammable	Red placards and red labels indicate a flammability or combustibility hazard. The most dangerous of these is **FLAMMABLE GAS.** These are already in vapor form and need only a source ignition such as a spark, flame or even heat produced by a catalytic convertor. These may also be **FLAMMABLE LIQUIDS.** (Label: **Flammable Liquid**)
Red/White Flammable solid	Self-explanatory. Examples: Red Phosphorus; camphor
Red/White/Blue -W-	Flammable solid which is water reactive. This may mean anything from moderate heating to explosive violence depending upon the product. Examples: Sodium, calcium; carbide

OPERATIONS AT THE SCENE

No attempt to affect a rescue should be made at the scene of a hazardous materials accident unless you have been trained to deal with this

type of accident. **Call for the help you will need.** These people may be the fire service, EPA, local hazardous material experts, and/or a law enforcement. Another agency to call that will be of great help is the Chemical Transportation Emergency Center (Chemtrec). This agency has a 24-hour toll-free number, 800-424-9300. Have your dispatcher call this agency when you are involved in a hazardous material rescue. They will be able to advise you as to the best course of action.

RADIATION HAZARDS

Emergency medical or rescue squad personnel are usually the first persons to see the case of radiation exposure of radioactive contamination. Their first acts will vary in degree whether they evacuate the victim(s) from a nuclear energy plant, from a university with a medical group regularly working with nuclear material or from a road transportation accident. Trained, knowledgeable co-workers, supervisors or health physicists are usually on hand at the plant but not at the road site.

When an accident occurs at a plant, the health physicist, supervisor, co-workers and the victim(s) should be able to inform members of the emergency or rescue unit the nature of the accident, number of victims and type of radiation exposure or radioactive contamination involved and possible body areas that may be affected. A gross measurement of the amount of radiation involved may be available; such information is most helpful.

When an accident involving radioactive material occurs along the road and no health physicist is available to provide technical information, the rescue squad personnel must determine the pertinent information for handling the patient. One of the first determinations to be made is, "Does this accident involve radioactive material?"

As was pointed out previously, none of the five senses can detect the presence of the radiations from the radioactive materials. For example, the presence of such a substance cannot be identified by smelling. Without proper instruments, rescue personnel must rely on other means to identify radioactive material.

Figure 2 depicts the American Standard Radiation Symbol that is used in the United States and some other countries to signify the actual or potential presence of nuclear radiations and to identify sources of these radiations.

This symbol can be found on radioactive source containers used for storage and in-plant transportation; painted on doors or walls; applied on tags, labels, or items of equipment or products containing radioactive materials and in many other places. Most applications of signs, tags, labels or the radiation symbol alone are for the dual purpose of identification and warning of the presence of a radiation source.

From what has been said the mere presence of radioactive substances should no longer evoke fear. We have learned that the transmmission of nuclear radiations from radioactive materials

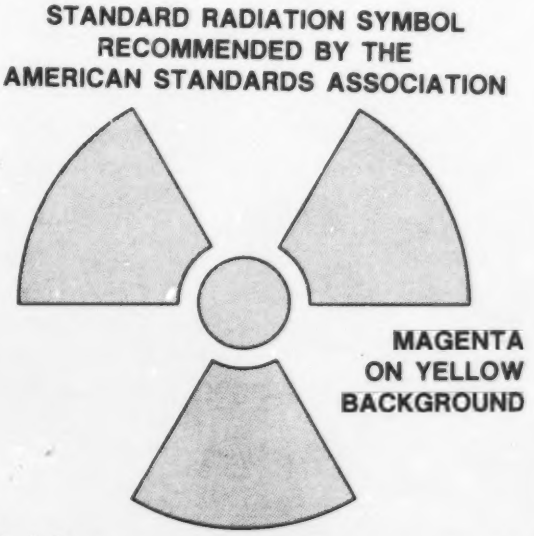

Figure 2. American Standard Radiation Symbol

can be greatly reduced or stopped entirely by means of shielding. Hence, radioactive materials are shipped in containers that are apt to be rather bulky and heavy. Radioactive materials to be shipped by land, air or water transport are packaged, identified and marked in accordance with definite prescribed regulations for the protection of the public health and safety. Figure 3 shows some medium size shipping casks, usually weighing from 200 or 300 lbs. to about 1000 pounds, that are used for shipments of radioactive material by land transport. Shipments of radioactive material to hospitals and schools are often in small enough quantities to be shipped in containers weighing only a few pounds and may travel by land or air transport. On the other end of the scale, shipments of nuclear reactor fuel may be made in accordance with the degree of potential hazard.

When being shipped from one place to another, all containers, regardless of size, are marked with the appropriate warning label or placard as specified by Department of Transportation or U.S. Postal regulations. Figure 4 illustrates such labels and placards. Look, then, for one or more of these identifying labels or placards. **In the event no label is observable, it is good practice to suspect any small but unusually heavy shipping container of being one that might contain radioactive material.** Once it has been determined that radioactive material is involved, it is the responsibility of the rescue squad to render the following care for the victim.

1. Give lifesaving emergency assistance if needed.

2. Secure pertinent information including a rough measurement of dose rates in the area.

3. Determine if physical injury or open wounds are involved. Cover wound with clean dressing;

Figure 3. Medium size shipping casks

use bandage to hold wound cover in place; do not use adhesive.

4. Cover stretcher, including pillow, with open blanket; wrap victim in blanket to limit the spread of contamination.

5. Notify hospital by radio or telephone and include all available information on the accident and condition of the victim.

NOTE: The local hospital should have a standard operating procedure for radiation accident patients; if not, the rescue unit along with the hospital and other local emergency service agencies should coordinate and develop a standard operating procedure for such accidents.

For emergency and EMT personnel:

1. Perform radiation survey of clothing and ambulance (paying particular attention to the tires and wheel wells) on arrival at the hospital before undertaking further activity.

2. If contaminated, discard clothing in container marked "Radioactive—Do not discard." Clean self by washing or showering as appropriate.

3. If in contaminated area, EMTs must be surveyed by radiation survey meter; measurements must be recorded. Cleansing effort should be limited to two washings.

4. Finally, above all, if ever involved in an accident with radioactive material, remain calm. The mere fact that one or more labelled containers are involved in an accident does not mean they have suddenly become dangerous. However, if any of them are broken open or appear to be leaking, seek expert advice before attempting to handle them.

The following method should be used in determining contamination levels.

A. Perform operational check on equipment (CDV-700 survey instrument).

(RED ON YELLOW)

(BLACK RADIATION SYMBOL ON YELLOW BACKGROUND)

(RED VERTICAL BAR)

(BLACK RADIATION SYMBOL ON YELLOW BACKGROUND)

(RED VERTICAL BAR)

Figure 4. Warning labels or placards

B. Attach the headset, open the probe shield.

C. Determine background radiation level (CPM).

D. Hold the probe about two inches from the surface and SLOWLY scan over the entire body from top to bottom, front and back.

E. Pay particular attention to the knees, feet, elbows, face, ears, hands, armpits and hair.

F. If any contamination is noted listening to the headphone, stop and read the meter.

G. Measurements on clothing, skin or hair greater than 0.75 mr/hr or 450 CPM above background is considered contamination.

H. If contamination cannot be reduced to these levels, the individual should be taken to the nearest hospital with nuclear medicine capability.

ASSISTANCE

Assistance may be secured from:

The Energy Research & Development Agency (ERDA)
Regional Coordinating Office
9800 S. Cass Avenue
Argonne, Illinois 60439
Tel. No. 312-972-4800 or
312-972-5731

Ohio Disaster Services Agency
Tel. No. 614-889-7150

Available EMS Publications

For ordering and pricing information contact:
Vocational Instructional Materials Laboratory
The Ohio State University
154 W. Twelfth Avenue
Columbus, Ohio 43210
Phone (614) 422-5001

Emergency Victim Care—Student Manual (EVCM)
Emergency Victim Care—Instructor Manual (EVCIM)
Emergency Victim Care—Workbook (EVWB)
EMS Binder—2½" Three-ring binder (EMTB)
Advanced EMT Instructor Manual (EVAIM)
EMS Slide/Tape Series
—Bleeding Control — 42 slides (EMST-1)
—CPR — 72 slides (EMST-2)
—Extrication — 79 slides (EMST-3)
—Fractures — 139 slides (EMST-4)
—Moving and Handling — 111 slides (EMST-5)
—Proper Examination — 68 slides (EMST-6)
—Vital Signs — 28 slides (EMST-7)
—Wounds and Bandaging — 79 slides (EMST-8)
—Anatomy and Physiology (EMST-9)
Victim Rescue Manual—Student Manual
Victim Rescue Manual—Instructor Manual
River Rescue Manual—Student Manual
River Rescue Manual—Instructor Manual
Farm Accident Rescue Manual